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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|------------------------|---------------------|------------------|
| 10/648,096 | 08/26/2003 | Niranjan Thirukkoyalur | 200210001-1 | 2748 |

22879 7590 01/10/2007
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| EXAMINER |
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WILLIAMS, SHERMANDA L

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| ART UNIT | PAPER NUMBER |
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1745

| SHORTENED STATUTORY PERIOD OF RESPONSE | MAIL DATE | DELIVERY MODE |
|--|------------|---------------|
| 3 MONTHS | 01/10/2007 | PAPER |

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/648,096

Applicant(s)

THIRUKKOVALUR, NIRANJAN

Examiner

Shermanda L. Williams

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 November 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-40 is/are pending in the application.
- 4a) Of the above claim(s) 1-7 and 26-40 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 8-25 is/are rejected:
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 August 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>1/5/2005</u> . | 6) <input type="checkbox"/> Other: _____ |

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DETAILED ACTION

Election/Restrictions

1. Applicant's election with traverse of Group I (claims 8-25) in the reply filed on 11/3/2006 is acknowledged. The traversal is on the ground(s) that examination of the claims in Group I and Group II can be made without serious burden to the examiner. This is not found persuasive because the groups are classified differently and therefore require different search fields. Group II requires forming a pattern and Group I does not and is therefore a distinct method. The search for Group II is not required for Group I. The requirement is still deemed proper and is therefore made FINAL. Claims 1-7, 26-49 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected invention, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on 11/3/2006.

Information Disclosure Statement

The information disclosure statement (IDS) submitted on 1/5/2005 was considered by the examiner.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 8-16 are rejected under 35 U.S.C. 102(e) as anticipated by Mardilovich et al. (US 2004/0033403 A1). Mardilovich et al. discloses a method of forming a micro-electro-mechanical system (MEMS) fuel cell. An anode, cathode, and electrolyte are deposited on a conductive substrate layer or current collector (Paragraph 21, Figure 5). The conductive substrate layer or current collector supports the other components of the fuel cell i.e. the anode, cathode, and electrolyte (Paragraph 25). The conductive substrate layer or current collector is constructed from a semiconductor or metal such as silicon or stainless steel (Paragraph 28). The conductive substrate is etched to form openings or holes in the substrate layer to allow passage of the reactants (Paragraph 27, 37, Figures 4B, 5, and 9). Mardilovich et al. discloses that the anode, electrolyte, and cathode are deposited as thin films on the substrate respectively (Paragraph 25, 29). Mardilovich et al. discloses that the order for depositing the cathode, anode, and electrolyte may be varied (Paragraph 28, 29). As, well Mardilovich et al. discloses that a porous current collector may be deposited to support other elements of the fuel cell structure (Paragraph 48). The fuel cell components such as the anode, cathode, and electrolyte are positioned on the surface of the first current collector and are thereby supported by the first current collector (Figure 4B).

4. Claims 8, 11-14, 19-25 are rejected under 35 U.S.C. 102(e) as anticipated by Beatty et al. (US 6,972,161 B2). Beatty et al. discloses a method of making a fuel cell assembly having a thickness of 30 to 800 micrometers (col. 4 lines 60-63). A first electrode, an electrolyte, a second electrode, and a second current collector are deposited on a first current collector (Figure 5, 6a-6j). Current collector is formed by

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such means as screen printing or deposition and etching techniques (col. 6 lines 34-39). Portions of the first and second current collect are removed to allow passage of the reactants (Figures 4e, 4f, 6j; col. 7 lines 27-39, col. 8 lines 20-30). Chemical etching is used to form the gas passages (col. 6 lines 63-65). After the addition of the second current collector, the layered structure is then sintered or fired (column 7 lines 30-40). Beatty et al. discloses that the current collector may be connected to the interconnects associated with the fuel cell packaging (col. 6 lines 33-35). The thickness of the first current collector is 5 to 100 times greater than the components supported by the current collector (col. 5 lines 25-30). Beatty et al. disclose that the thickness of the anode, cathode, and electrolyte ranges from 1 to 100 micrometers per component (col. 6 lines 53-54, col. 7 lines 9-13, 22-23).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 17 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mardilovich et al. (US 2004/0033403 A1) in view of Aitken et al. (US 5,273,837).

The disclosure of Mardilovich et al. discussed above is incorporated herein.

Mardilovich et al. does not teach that the current collector of a first fuel cell is interconnected to a current collect of a second fuel cell.

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7. Aitken et al. teaches a solid electrolyte fuel cell with an interconnect portion.

Multiple fuel cells are interconnected in series or parallel via electronically conductive interconnect material such as conductive ceramic or metal (col. 1 lines 19-22). Aitken et al. does not explicitly state that the current collector of the current collector of a first fuel cell is interconnected to a current collect of a second fuel cell. However, it have been obvious to one having ordinary skill in the art at the time the invention was made to modify Mardilovich et al. in view of Aitken et al. to include interconnects between the first and second fuel cell current collects such as taught by Aitken et al. in order to increase the voltage output of the fuel cell stack depending on the voltage requirements of a particular application.

8. Claims 22 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Beatty et al. (US 6,972,161 B2) in view of Nammensma et al. (US 2006/0093887 A1). Beatty et al. discloses a method of forming a fuel cell having a first electrode, an electrolyte, a second electrode, and a second current collector deposited on a first current collector as discussed above. Beatty et al. does not teach that the current collector is ten to twenty times thicker than the electrodes or the electrolyte or that the current collector has a thickness between ten and one thousand microns. Nammensma et al. teaches an anode supported solid oxide fuel cell having a current collect with a thickness of ten to twenty microns (Paragraph 13). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Beatty et al. in view of Nammensma et al. to include a first current collect with a thickness between

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ten and one thousand microns such as taught by Nammensma et al. in order to reduce the overall size of the fuel cell in turn increasing the power density of the cell.

9. The ratio of the current collect thickness (ten to twenty microns) taught by Nammensma et al. and the electrode or electrolyte thickness (one to hundred microns) taught by Beatty et al. falls with the range of ten to twenty (for the smaller values of electrode or electrolyte thicknesses) as stated in claim 22. It would have been obvious to one having ordinary skill in the art at the time the invention was made to use thin current collectors, electrodes, or a thin electrolyte layer to decrease the overall size of the fuel cell stack.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shermanda L. Williams whose telephone number is (571) 272-8915. The examiner can normally be reached on Mon.-Thurs. 7 AM - 4:30 PM and alternating Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



SUSY TSANG-FOSTER
PRIMARY EXAMINER